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10/534,489	05/11/2005	Sung Ho Choo	3449-0477PUS1	7114

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EXAMINER
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ARMAND, MARC ANTHONY

ART UNIT	PAPER NUMBER
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2814

NOTIFICATION DATE	DELIVERY MODE
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08/13/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/534,489	<b>Applicant(s)</b> CHOO ET AL.	
	<b>Examiner</b> MARC ARMAND	<b>Art Unit</b> 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2010.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,4,5,7,8,10 and 53-64 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4,5,7,8,10,53,54,58,59 and 61-64 is/are rejected.
- 7) ☒ Claim(s) 55-57 and 60 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 June 2010 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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**4. Claims 1,4,5,10,53,59,62 are rejected under 35 U.S.C. 103(a) as being obvious over Slater et al; (Slater) US 2003/0015721 in view of Huang et al; (Huang) US 6,693,352 and in view of Slater et al; (Slater) US 2002/0123164.**

5. Regarding to claim 1, Slater shows in fig.6, a device light emitting device, comprising: a first conductive semiconductor layer (30a)(comprising a n-type layer, and active layer and a p-type layer)((Para 0025)(Para 0004); an active layer (in layer 30a) (Para 0025)(Para 0004) formed on the first conductive semiconductor layer; a second conductive semiconductor layer (in layer 30a) formed on the active layer (in layer 30a)(Para 0004)(Para 0025); a first metal (32)(Para 0044) formed on the GaN-based semiconductor layer; a first metal layer formed on the first metal (36a)(Para 0044), the first metal layer (36a) being a substantially pure metal layer; a third metal (36b) formed on the first metal layer (36a); and a conductive oxidation(60)(Para 0052) preventive layer formed on the third metal (36b) layer.

Slater differs from the claimed invention because he does not explicitly disclose a semiconductor device having a high concentration GaN-based semiconductor layer formed on the second conductive semiconductor layer; a first metal-Ga compound layer formed on the high concentration GaN-based semiconductor layer; a first metal layer formed on the first metal-Ga compound layer, the first metal layer being a substantially pure metal layer; a third metal-Al compound layer formed on the first metal layer; and a conductive oxidation preventive layer formed on the third metal-Al compound layer.

Huang shows in fig.3-10, a semiconductor device having a high concentration GaN-based semiconductor layer (32)(col.4,line 39-42) formed on the second conductive

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semiconductor layer (31 or 51)(col.4,line39-40); a first metal-Ga compound layer (35)(col.4,line 40-45) formed on the high concentration GaN-based semiconductor layer (32); a first metal layer (36a)(col.5,line 25-30) formed on the first metal-Ga compound layer (35), the first metal layer (36a) being a substantially pure metal layer; a third metal (37a) (col.5,line 40-42) formed on the first metal layer (36a); and a conductive oxidation (38a)(col.5,line 40-50) preventive layer formed on the third metal (37a) compound layer.

Huang is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Huang in the device of Slater to have a semiconductor device having a high concentration GaN-based semiconductor layer formed on the second conductive semiconductor layer; a first metal-Ga compound layer formed on the high concentration GaN-based semiconductor layer; a first metal layer formed on the first metal-Ga compound layer, the first metal layer being a substantially pure metal layer; a third metal formed on the first metal layer; and a conductive oxidation preventive layer formed on the third metal compound layer in the device of Slater because it will transmit the light more efficiently (col.2,line 30-45).

Slater shows in fig.17a, a device having a third metal-Al (1744) compound layer formed on the first metal layer (1742) (Para 0097).

Slater is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater and Huang. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Slater in the device of Slater and Huang to have a device having a third metal-Al compound layer formed on the first metal layer in the device of Slater and Huang because it will provide a device with more efficiency (Para 0097) and will improve the light extraction of the device (Para 0025).

Regarding claim 4, Slater in view of Huang and Slater discloses a light emitting device wherein the second conductive semiconductor layer is a P-type or N-type GaN-based layer (30a)(Para 0025).

Regarding claim 5, Slater in view of Huang and Slater discloses a light emitting device wherein the first metal layer (36a) is W (Para 0044).

Regarding claim 10, Slater in view of Huang and Slater discloses a light emitting device wherein the conductive oxidation preventive layer is of Au (60)(Para 0049).

Regarding claim 53, Slater in view of Huang and Slater discloses a light emitting device wherein the first conductive semiconductor layer is an N-type layer (30a)(Para 0025)(Slater reference), and the second conductive semiconductor layer and the high concentration GaN-based (32) semiconductor layer are P-type layers.

As for the p and n type layers, It would have been obvious to one having ordinary skill in the art at the time of the invention was made to a p or n type layer, since it has been held that a mere reversal of the essential working parts of a device involves only routine skill in the art.. MPEP 2144.04.

Regarding claim 59, Slater in view of Huang and Slater discloses a light emitting device wherein the first conductive semiconductor layer (240) (Slater US 2002/0123164 reference) (Para 0052) comprises at least one of an Al material or an In material.

Regarding claim 62, Slater in view of Huang and Slater discloses a light emitting device wherein the third metal-Al compound layer is a metal layer (1744)(Para 0097)(Slater US 2002/0123164 reference).

**6. Claims 7, 8, 54,62 are rejected under 35 U.S.C. 103(a) as being obvious over Slater, Huang and Slater as applied to claims 1,4,5,10,53,59,62 and further in view of Sheu; (Sheu) US 2003/0122147.**

Regarding claims 7 and 8, Slater in view of Huang and Slater discloses an LED device having a third metal.

Slater in view of Huang and Slater differs from the claimed invention because he does not explicitly disclose a semiconductor device having a metal is of one selected from the group consisting of Ni, Pt and Pd.

Sheu discloses (Para 0032), a device having a metal that is of one selected from the group consisting of Ni, Pt and Pd (Para 0032).

Sheu is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater in view of Huang and Slater. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Sheu in the device of Slater in view of Huang and Slater to have a device having a metal that is of one selected from the group consisting of Ni, Pt and Pd in the device of Slater in view of Huang and Slater because it will improve the light efficiency

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of the device (Para 0039) and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.. MPEP 2144.07.

As for the metal having a high reactivity with Al; both device are formed of the same material and have a similar structure, therefore they will have the same property. The metal of Sheu will have a high reactivity with Al.

Regarding claim 54, Slater in view of Huang and Slater discloses an LED device having a first metal that is W (36a) and a third metal.

Slater in view of Huang and Slater differ from the claimed invention because he does not explicitly disclose a semiconductor device having a metal is of one selected from the group consisting of Ni, Pt and Pd.

Sheu discloses (Para 0032), a device having a metal that is of one selected from the group consisting of Ni, Pt and Pd (Para 0032).

Sheu is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater in view of Huang and Slater. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Sheu in the device of Slater in view of Huang and Slater to have a device having a metal that is of one selected from the group consisting of Ni, Pt and Pd in the device of Slater in view of Huang and Slater because it will improve the light efficiency of the device (Para 0039) and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. MPEP 2144.07.



**7. Claim 58 is rejected under 35 U.S.C. 103(a) as being obvious over Slater, Huang and Slater as applied to claims 1,4,5,10,53,59,62 and further in view of Kim et al; (Kim) US (KR 226831 B).**

Regarding claim 58, Slater in view of Huang and Slater disclose a light emitting device wherein a first metal layer, a third metal-Al compound layer, and the conductive oxidation preventive layer form an electrode.

Slater in view of Huang and Slater differ from the claimed invention because he does not explicitly disclose a semiconductor device having a first metal-Ga compound layer that is an electrode.

Kim shows in fig.2c, a LED device having a Gati (15) later that is an electrode compound.

Kim is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater in view of Huang and Slater. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Kim in the device of Slater in view of Huang and Slater to have a semiconductor device having a first metal-Ga compound layer that is an electrode in the device of Slater in view of Huang and Slater because it will provide good conductivity (Para 22) and also It would have been obvious to one having ordinary skill in the art at the time of the invention was made to replace the first metal electrode of Slater in view of Huang and Slater with Kim's Gati electrode in the device of Slater in view of Huang and Slater, since it has been held to be within the general skill of a worker in the art to

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select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. MPEP 2144.07

**8. Claim 61 is rejected under 35 U.S.C. 103(a) as being obvious over Slater, Huang and Slater as applied to claims 1,4,5,10,53,59,62 and further in view of Tamamura et al; (Tamamura) USPAT 6,084,251.**

Regarding claim 61, Slater in view of Huang and Slater discloses a device having a second conductive layer.

Slater in view of Huang and Slater differs from the claimed invention because he does not explicitly disclose a semiconductor device having a conductive layer that comprises a vacancy structure.

Tamamura shows in fig.1, 2, a device having a conductive layer (9) having a vacancy structure (claims 2, 23) (col.5, line 60-67).

Tamamura is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater in view of Huang and Slater. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Tamamura in the device of Slater in view of Huang and Slater to have a semiconductor device having a conductive layer that comprises a vacancy structure in the device of Slater in view of Huang and Slater because it will prevent degradation (col.3, line 35-37) and reduce defects in the device (col.4, line 20-25).

**9. Claims 63, 64 are rejected under 35 U.S.C. 103(a) as being obvious over Slater, Huang and Slater as applied to claims 1,4,5,10,53,59,62 and further in view of Asami et al; (Asami) USPAT 5,959,401.**

Regarding claims 63, 64, Slater in view of Huang and Slater discloses a device having a high concentration GaN-based semiconductor layer (32)(Huang reference).

Slater in view of Huang and Slater differs from the claimed invention because he does not explicitly disclose a semiconductor device having a high concentration layer with a carrier concentration of more than  $10^{18}\text{cm}^{-3}$  and wherein a high concentration GaN-based semiconductor layer comprises a carrier concentration more than a carrier concentration of the second type conductive semiconductor layer.

Asami discloses (col.3, line 29-33), a semiconductor device a layer (3) with a carrier concentration of more than  $10^{18}\text{cm}^{-3}$  and wherein a high concentration GaN-based semiconductor layer (3) comprises a carrier concentration more than a carrier concentration of the second type conductive semiconductor layer (4).

Asami is evidence that ordinary workers skilled in the art would find reasons, suggestions or motivations to modify the device of Slater in view of Huang and Slater. Therefore, at the time the invention was made; it would have been obvious to use the teaching of Asami in the device of Slater in view of Huang and Slater to have a semiconductor device having a high concentration layer with a carrier concentration of more than  $10^{18}\text{cm}^{-3}$  and wherein a high concentration GaN-based semiconductor layer comprises a carrier concentration more than a carrier concentration of the second type conductive semiconductor layer in the device of Slater in view of Huang and Slater because it will improve the luminous intensity and the reliability of the device (col.2,line 10-12) and also it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. MPEP 2144.05.

***Allowable Subject Matter***

10. Claims 55-57, 60 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

11. Applicant's arguments with respect to claims 1, 4, 5, 7, 8, 10, 53-64 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARC ARMAND whose telephone number is (571)272-9751. The examiner can normally be reached on 9-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MARC ARMAND/  
Examiner, Art Unit 2814

/Wael M Fahmy/  
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